Spectral Calibration
AIRS RTA
Concerns

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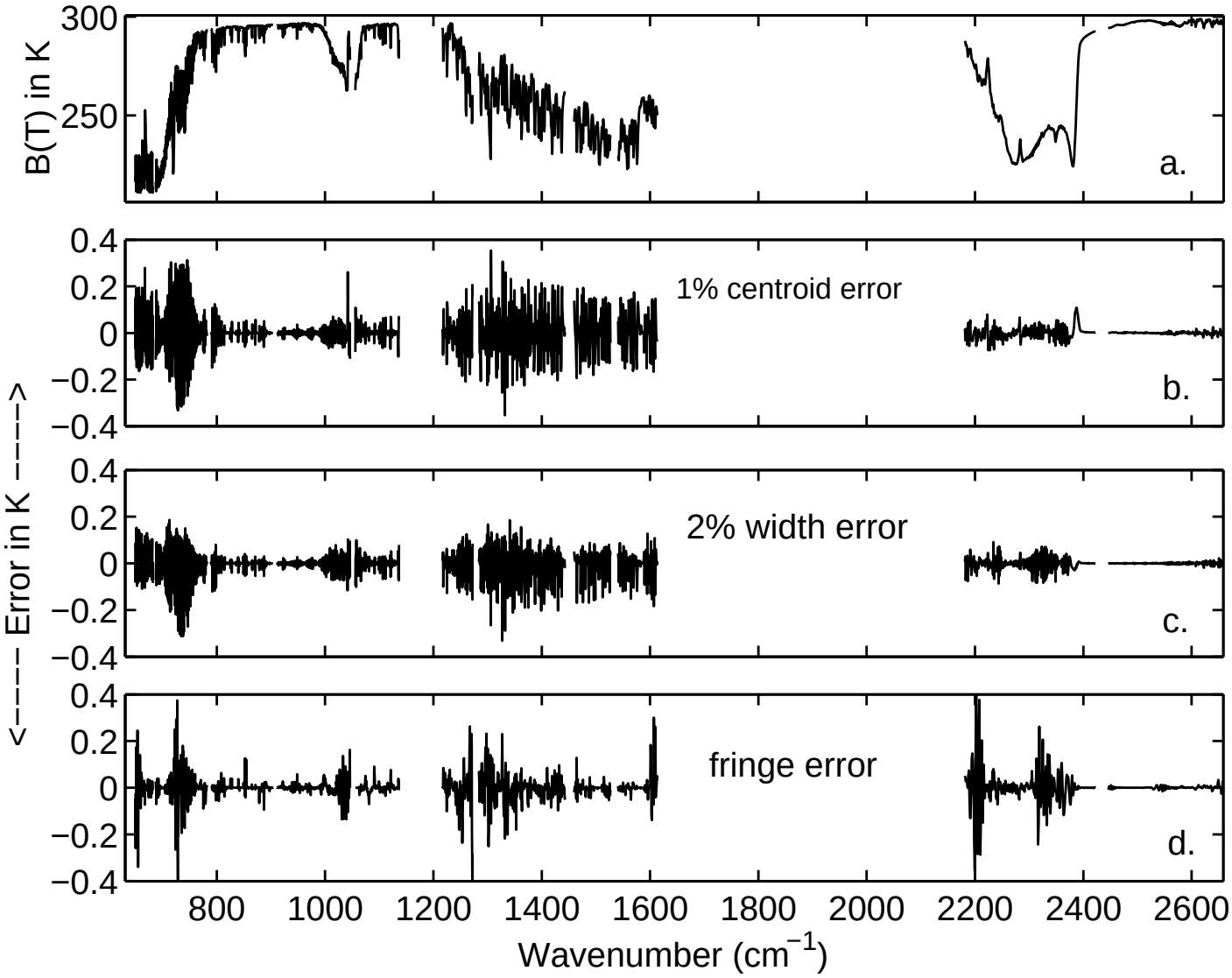
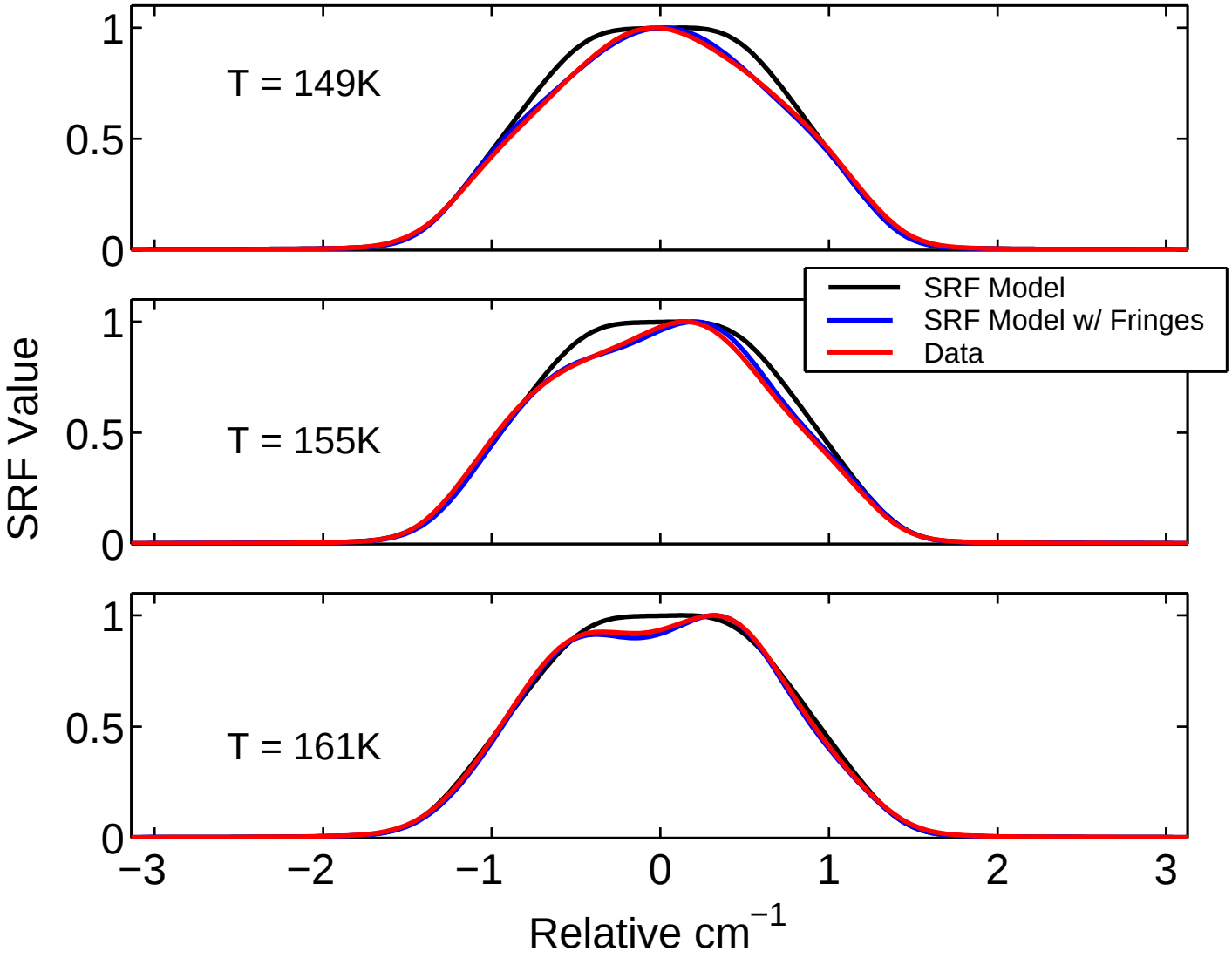
Spectral Calibration

- Very successful, met 1% requirements, or better
- SRF centroids 0.5-1%, validated grating model and provided corrections that will be used in orbit
- SRF widths 1%
- SRF shape errors less than 0.2K, except for 2374 - 2386 cm^{-1}. SRF B(T) errors about 0.4K at 2380 cm^{-1}, down to 0.1K at 2386 cm^{-1}.
- Never analyzed SRFs if focus changes. Make sure final focus fits are close to lab measurements.
- Still waiting on “final” fringe model from BAE
- References in paper

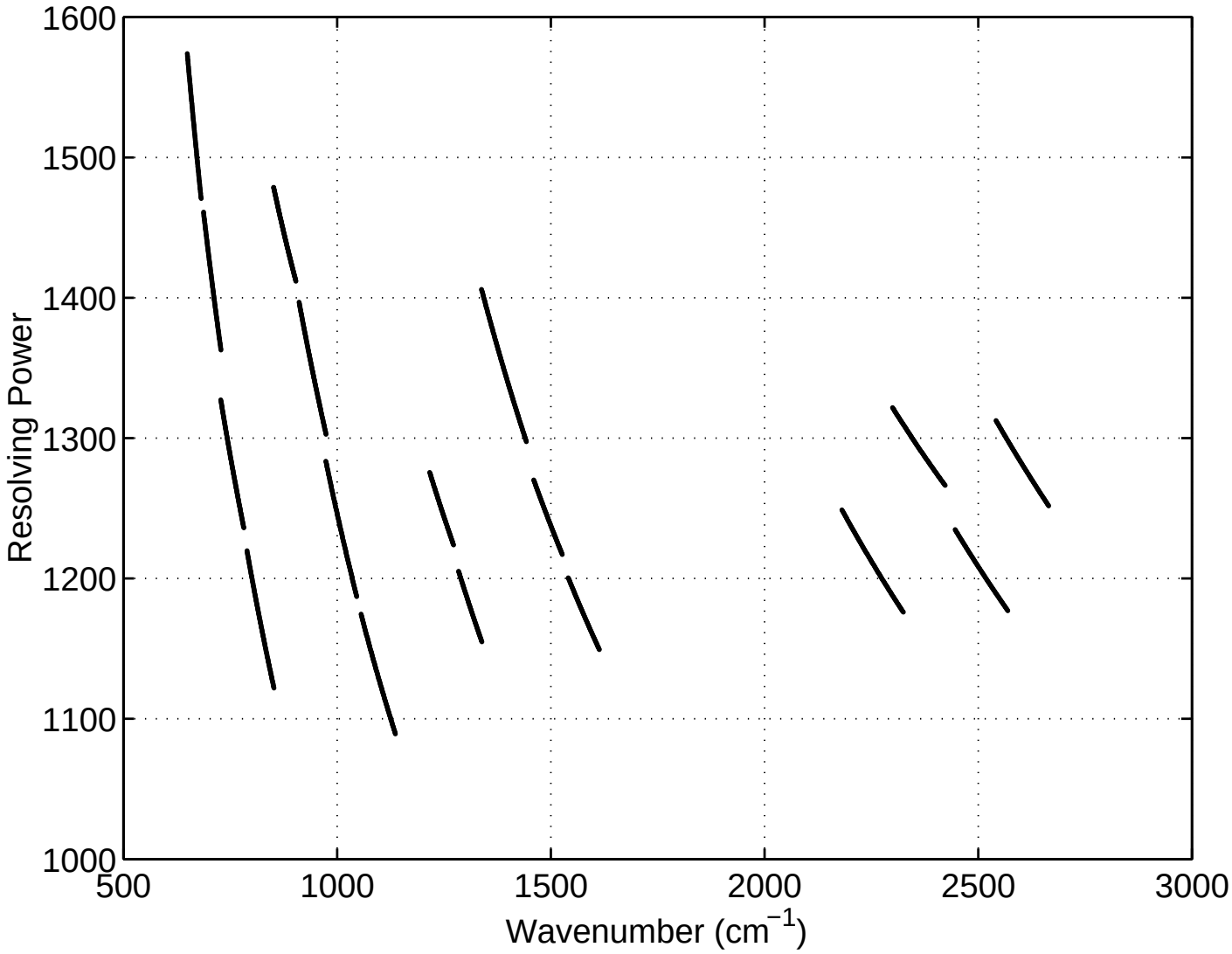
Forward Model Sensitivity to SRF Parameters



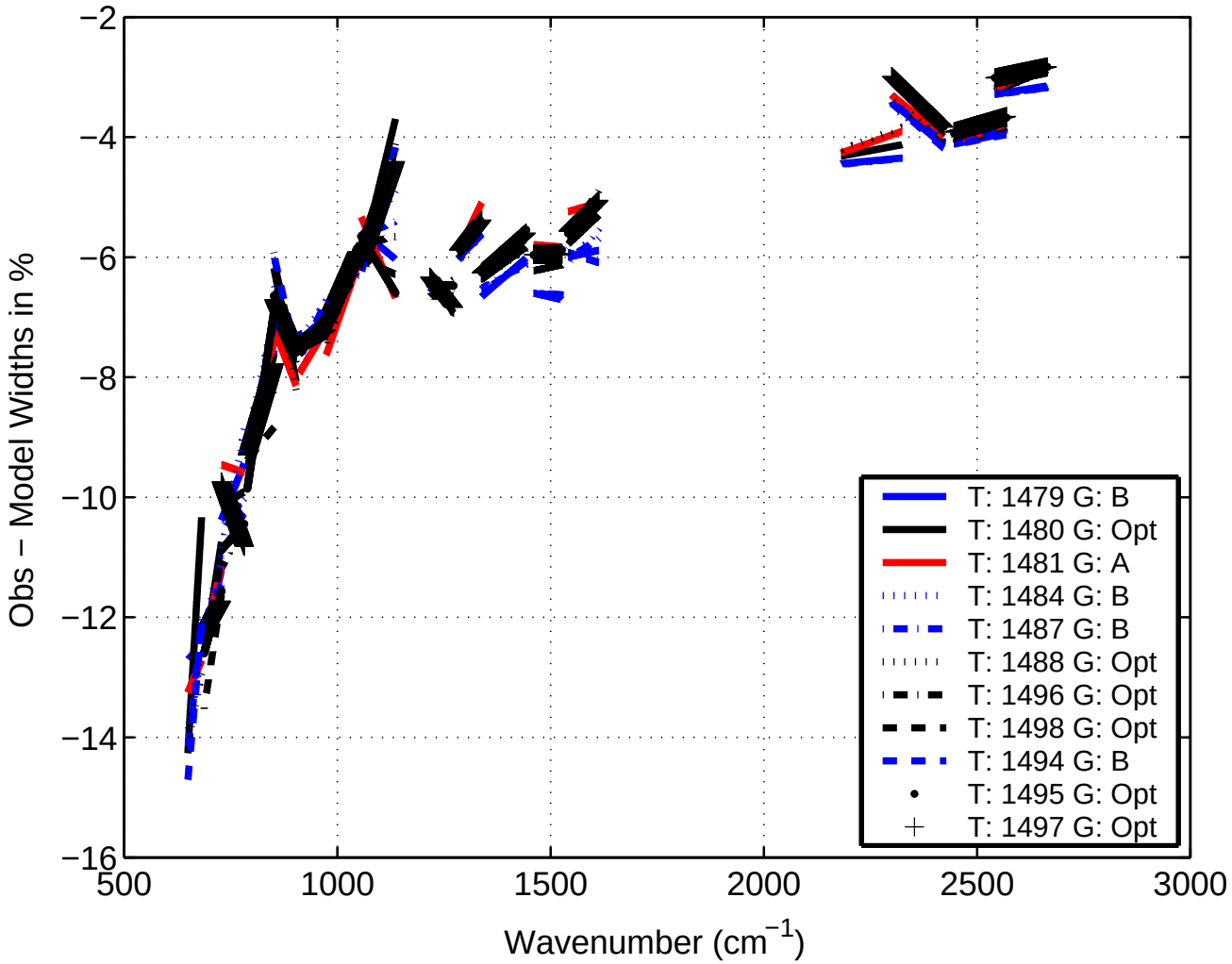
Fringes Move Across SRF as T Changes



AIRS Nominal Resolving Power is ~1300, not ~1400



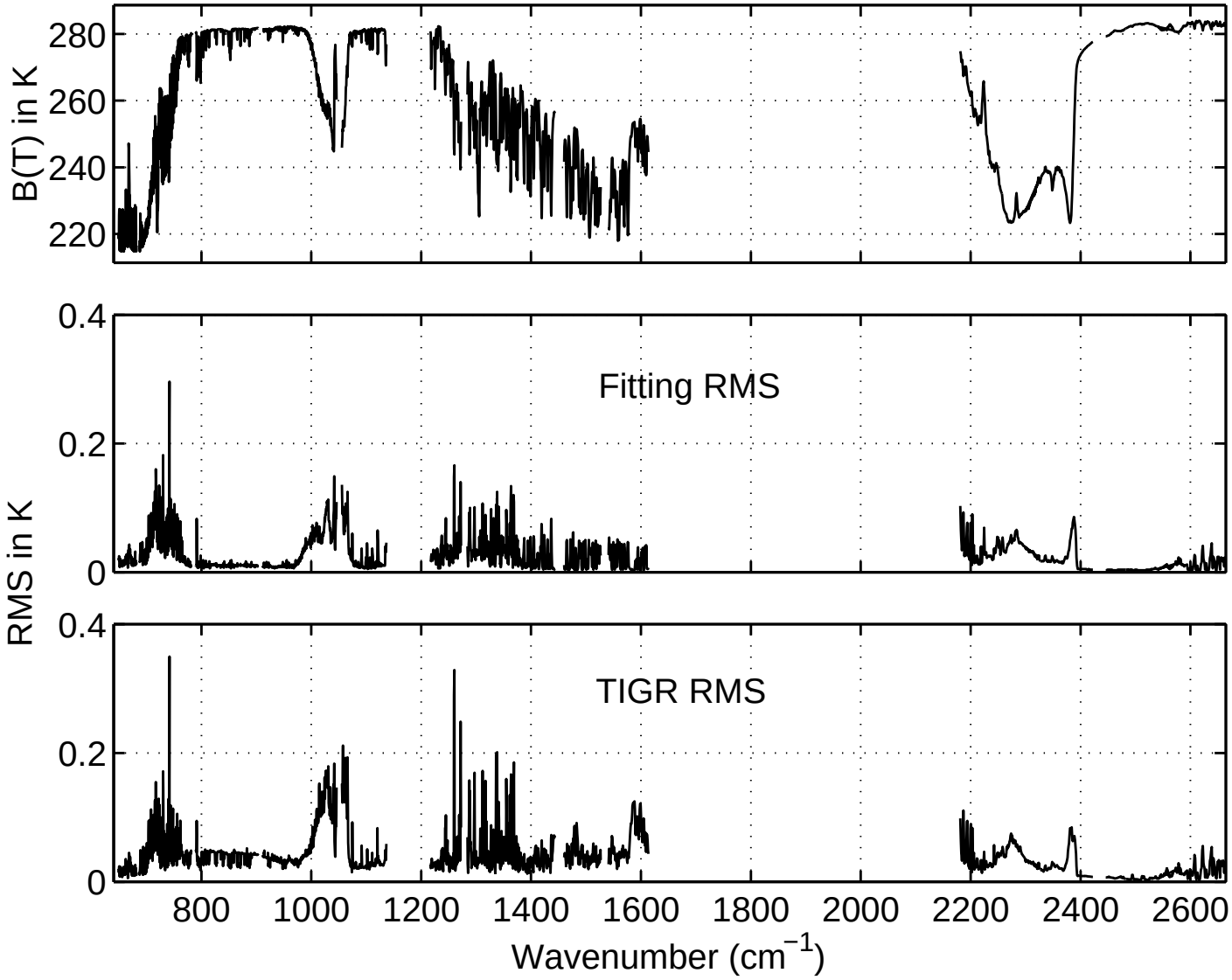
Higher Resolving Power Still a Mystery



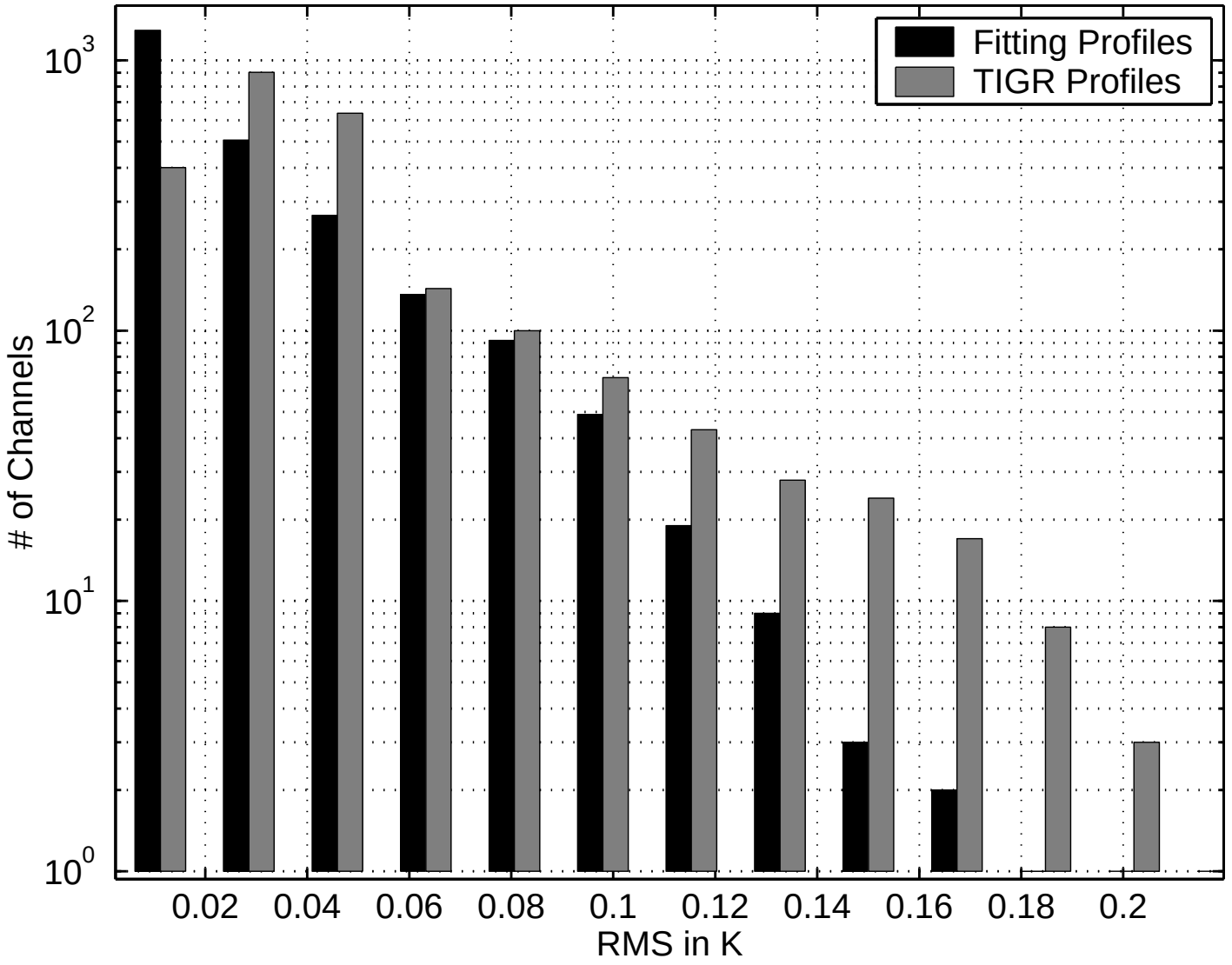
AIRS-RTA

- Less tested than retrieval system!
- Reflected thermal errors may dominate in semi-windows
- Keep careful track of minor gas amounts
- H_2O continuum changed from CKD-2.3 to CKD-2.4. We decided to "keep up", but I don't like some of the changes, up to 2K issues. Working on RAL data to finalize.
- References: Joel: finite diff derivatives using ~13 trapezoids.

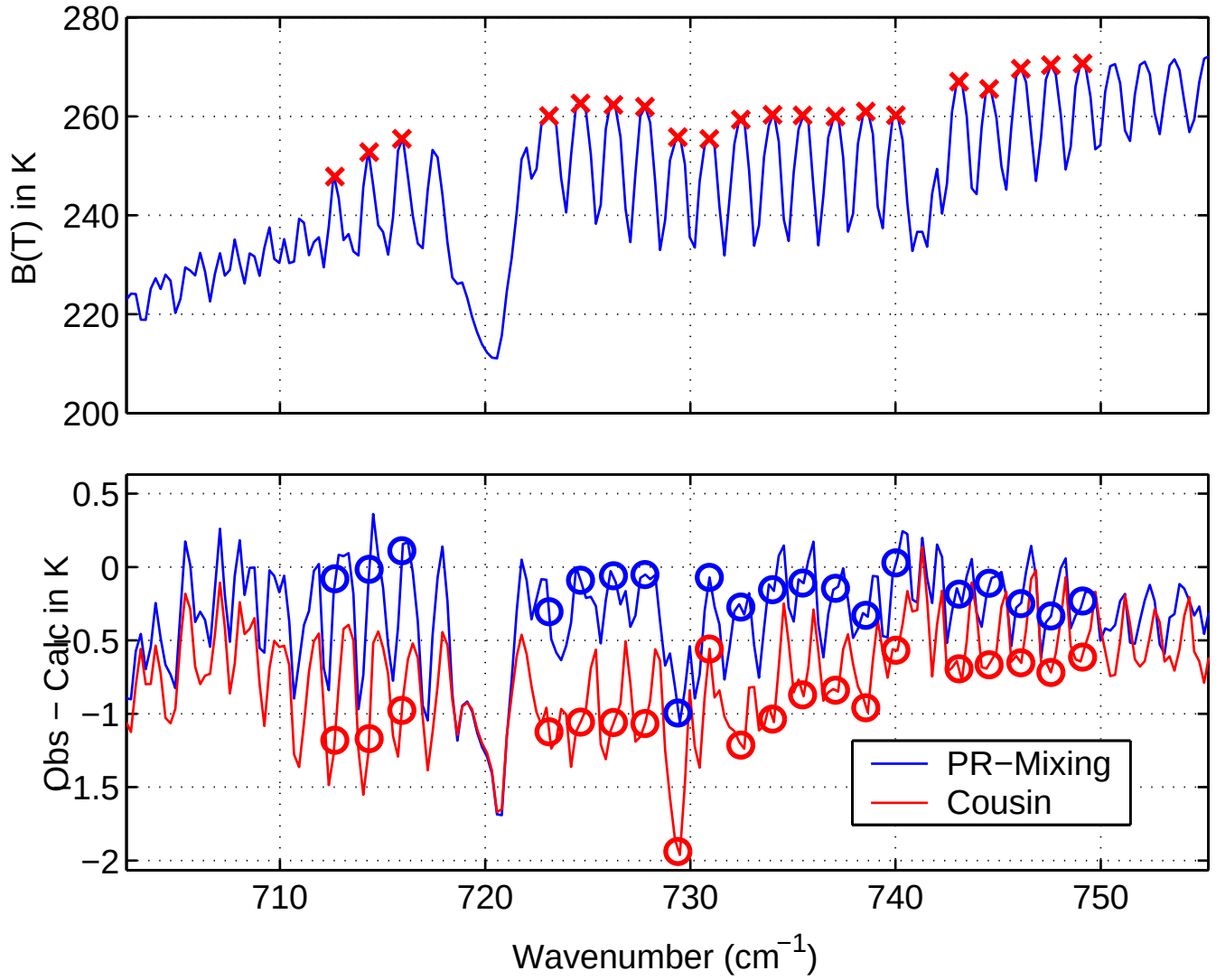
Fast Model Parameterization Below Noise



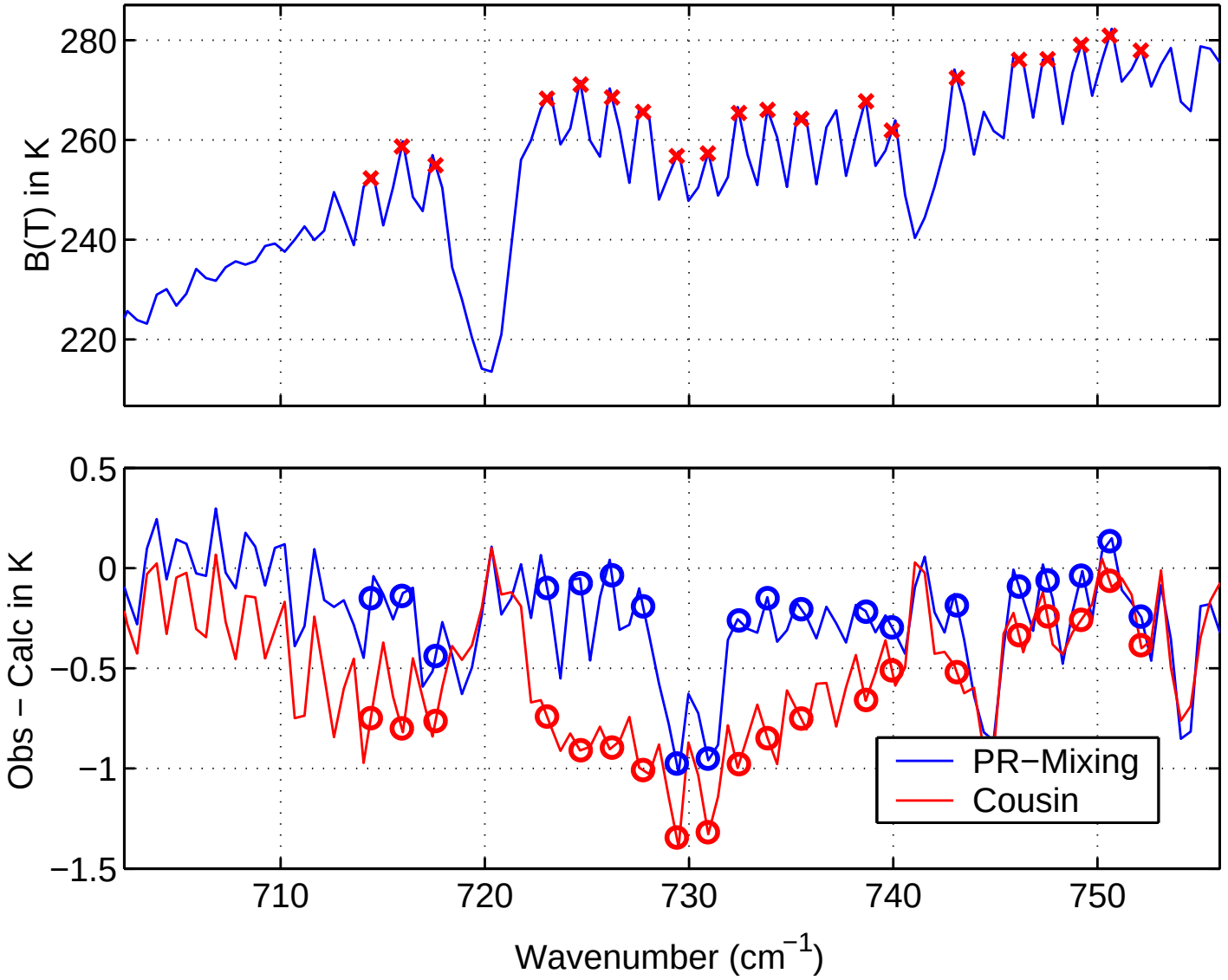
Fast Model Error Using Independent Profile Set



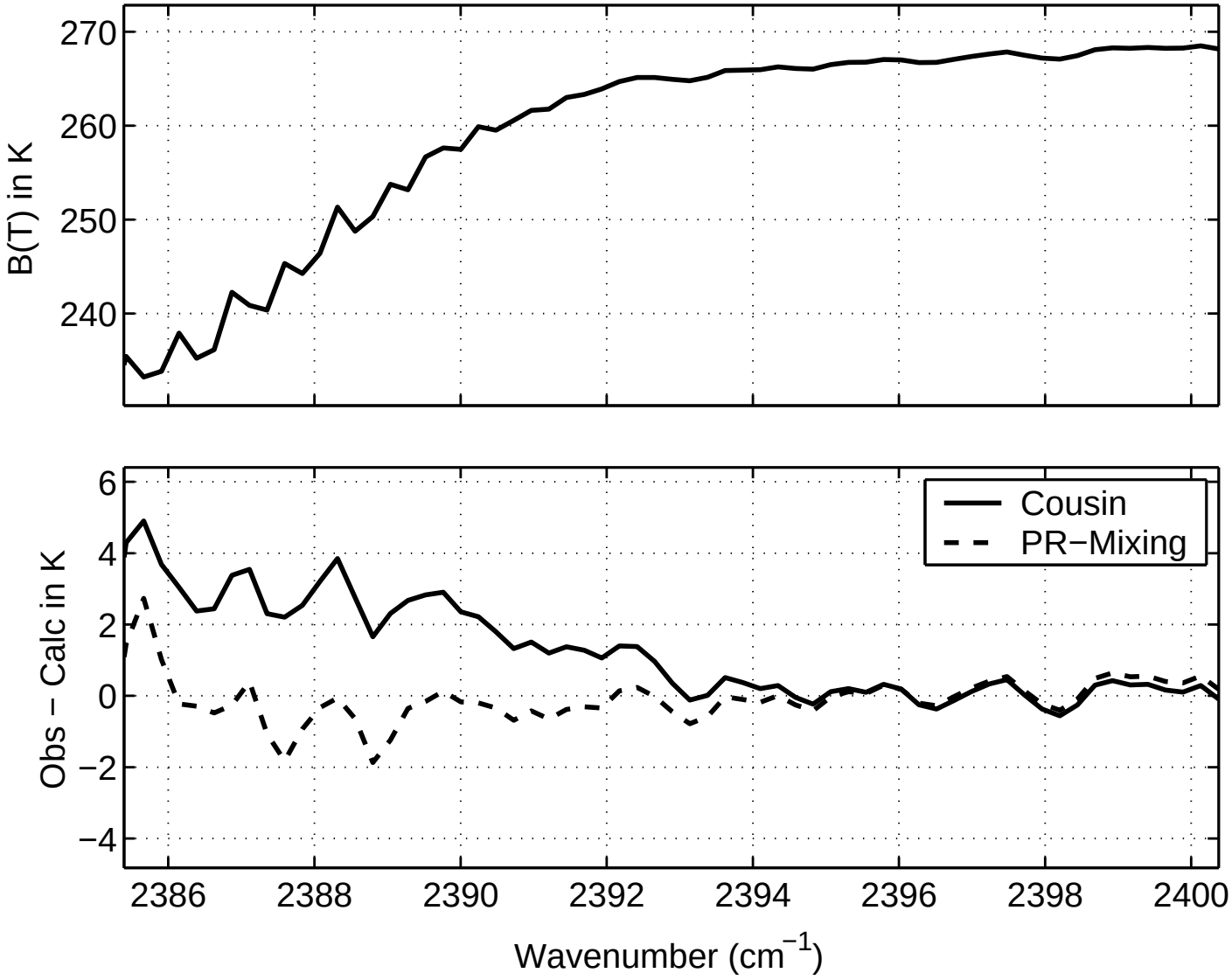
WINTEX: O-C With and Without P/R Mixing



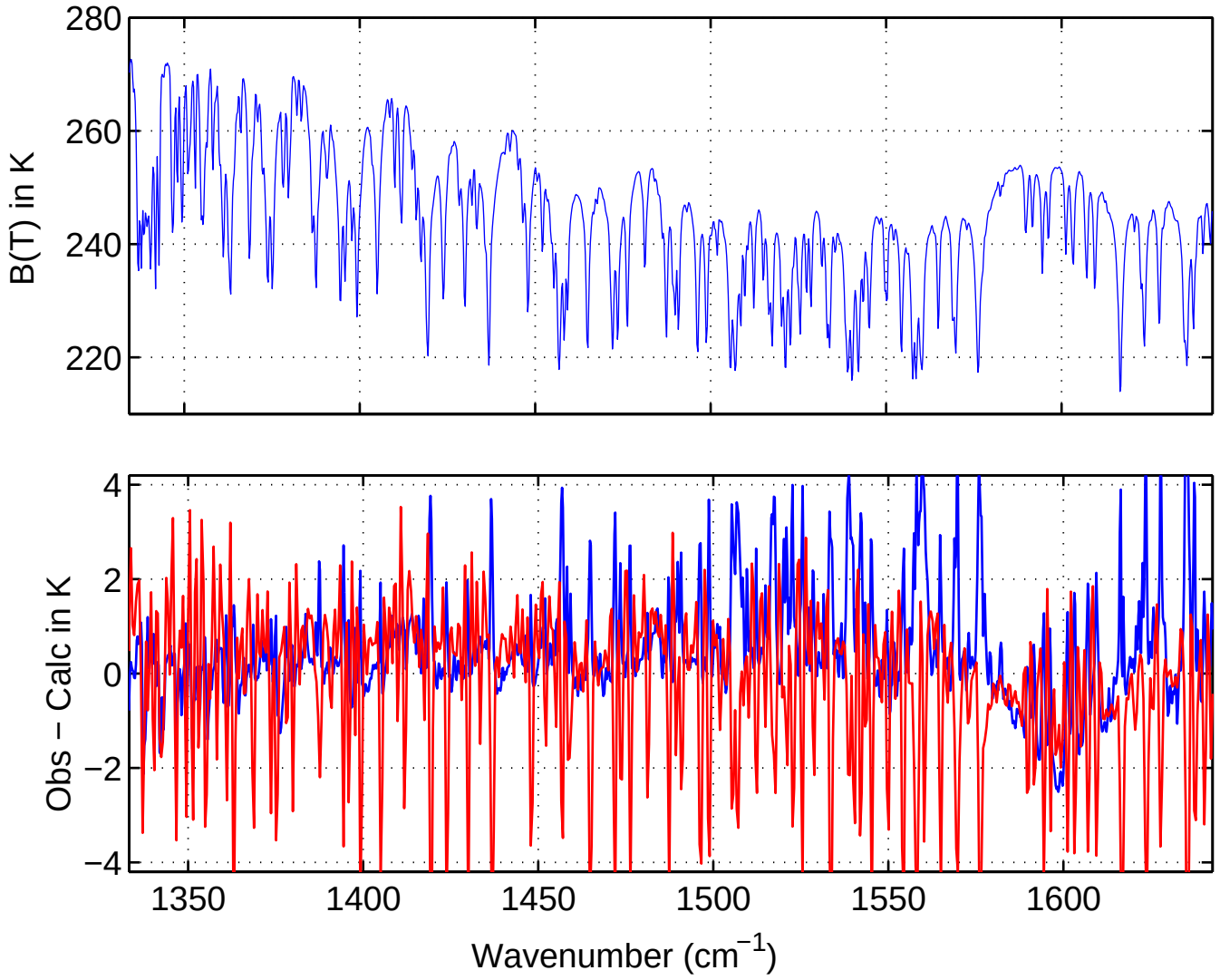
ECMWF vs S-HIS during CLAMS



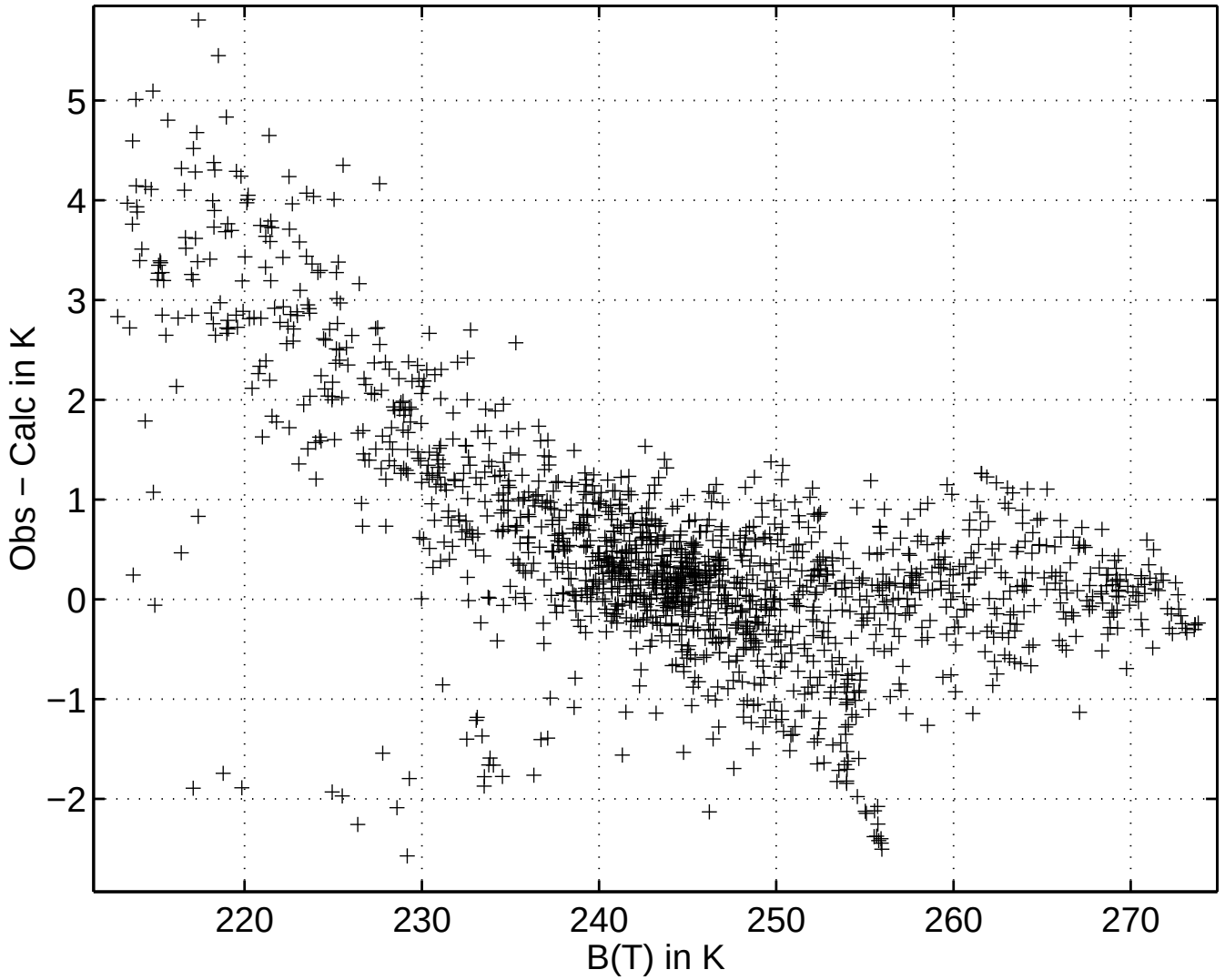
Sonde vs NAST-I during WINTEX



CAMEX-1, WINTEX H_2O Obs-Calcs using Sondes



WINTEX O-C vs B(T) Observed



Concerns

- RAOB matchups. Have we agreed that PREPQC is not as good as L. McMillin's RAOB database?
- Synoptic matchups needed (especially early on), but too large. Will subset file be generated to replace these?
- Tuning: DAAC products are for climate, not weather? Will certain kinds of tuning make them difficult to interpret?

RAOB Matchups

- Will JPL be doing bias evaluation with PREPQC or Larry Mcmillin's matchups?
- QC with Larry's matchups?
- System ready for keeping latest L1b in Larry's matchups?

Synoptic Matchups

- Synoptic matchups provide early bias evaluation over many conditions, should be good for temperature in Northern Hemisphere
- Original matchup system producing 4-5 Gbytes per day, without global coverage for mapping other products
- A data subset may be in the works? When ready?
- UMBC could do our own subset on weather for 1 day a week, or something similar. Need to know soon if we need to get set up to do this?
- Status of Mitch Goldberg's gridded data subset?

Tuning

- We should strive to correct problems at their source: radiance calibration, SRF, forward model spectroscopy and RTA parameterization
- Spectroscopy should not “drift”
- Rad calibration/SRFs could “drift”, but we should be able to diagnose the problem as rad cal/SRFs.
- Do we have a way to update Rad Cal “drift” (in L2 S/W)?
- If SRFs drift, need to reprocess if not tuning. Hopefully won’t happen.
- Eventually concentrate on dedicated validation sites for spectroscopy errors
- Complicated tuning will make climate products difficult to interpret

Truth Errors and Tuning

- "Truth" errors are known/understood in profile space
- Instrument errors are determined in radiance space
- AIRS-RTA errors can be understood in both profile/radiance space. Note, we generate layer τ's in RTA.

Profile vs Radiance Tuning

- Number of tuning parameters
  - Radiance: 2378 tuning adjustments
  - Profile: 13 $\longrightarrow$ 100 for T(p), 7 $\longrightarrow$ 100 for Q(p)
- RTA mixes many layers of T(p) and Q(p). Error-free and error-prone parts of truth profiles can both contribute to same channel. Especially important for H_2O.
- Can we tune the product rather than the radiances? Requires fewer parameters, allows easier handling of "truth" errors.
  - Radiance: 2378 x N
  - Product: 2 x 200 x N
  - Instrument: 17 x 2 x N
  - AIRS-RTA: ? 5-10 + H_2O continuum
  - Spectroscopy: # gases x (2-5)
- Use tuning in beginning to speed development, but then transition over to fixing observed/computed radiances in a physically acceptable way.